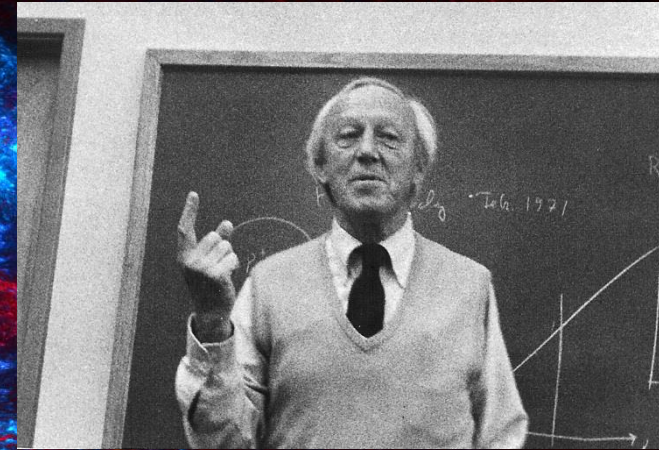


# Dr. Hannes O.G. Alfvén (1908-1995)

## Importance

The work in the field of Magnetohydrodynamics (MHD) was pioneered by Dr. Alfvén. MHD is the study of the movement of any electrically conducting fluid namely plasma. His studies would start the world toward understanding many of the plasma properties known today. This work is extremely important to a wide range of the physical sciences and engineering. In the sciences (according to the Saha Equation)  $10^{122}$  parts to one are in the plasma state in the universe. Therefore, to fully understand anything in the cosmic realm, one must be very familiar with Magnetohydrodynamics. In engineering, the use of plasma is central to the drive towards fusion technology which will one day power the world. Containing the plasma with a magnetic field and creating a net gain in power continues to be one of the most difficult challenges posed to mankind.

The next generation of nuclear plant will use molten salt to cool the reactor vessel. This will use magnetic pumps which have no moving parts, only pulsing magnetic fields, and do not physically interact with the radioactive coolant, decreasing the amount of waste generated in the lifetime of the plant.



## Work

The most difficult part of MHD work is that the fluid has many properties of each different type of matter. Most of the collisions within the realm of MHD can be considered elastic while the total flow is similar to that of a fluid. With regards to compressibility and heating, the plasma can sometimes be considered an ideal gas. The issue arises though when one must consider that a plasma is made solely of charged particles, each with a moving electric and magnetic field. Combining all of these portions together makes for some extremely in depth and complicated mathematics. Few applicable equations can be solved analytically and many must be solved numerically. Finally, most plasmatic configurations are unstable so finding setups which will last on measureable timescales on Earth are extremely difficult.

